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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,791	07/14/2003	Thorsten Pannek	10191/3085	7312

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EXAMINER	
BRUENJES, CHRISTOPHER P	
ART UNIT	PAPER NUMBER
1772	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/15/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/618,791	PANNEK ET AL.	
	Examiner	Art Unit	
	Christopher P. Bruenjes	1772	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 December 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *10-19* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitation "the functional layer in the areas is in direct contact with a layer situated underneath the at least one first sacrificial layer" renders the claim vague and indefinite. The additional limitations added to claim 5 has not clarified the issues created by the limitations in claim 5. It is not understood how an immovable element can be in direct contact with a layer that is beneath the layer that the functional layer is contacting. If the layer first sacrificial layer is removed from an area in which is was present between the immovable element and the layer beneath the first sacrificial layer, then the immovable element and the layer beneath would still not be in direct contact. There may not be any other layer between the

two layers as shown in Applicant's Figure 2, but the immovable element and the layer underneath the sacrificial layer are still not contacting each other, there is a gap of air between the element and layer. The only way the immovable object could be actually contacting the layer underneath is if it somehow shifted downward after removing the sacrificial layer. Note Applicant's specification does not appear to provide any support for an immovable element shifting during the process of creating the component.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Reichenbach et al (WO 01/46066 A2). US 2004/0065932 A1 is used as the English equivalent for WO 01/46066 A2 for purposes of citing within this rejection.

Regarding claim 1, Reichenbach et al anticipate a component comprising a functional layer (reference number 16, Figure 10).

A surface micromechanical structure is produced in the functional layer including movable elements (reference number 26, Figure 10) and immovable elements (represented by the other parts of the functional layer 16). The component further comprises at least one electrically non-conductive first insulation layer (reference number 12, Figure 10 outside the void area) and at least one first sacrificial layer (reference number 30, Figure 10) and a substrate (reference number 10, Figure 7). The substrate is connected to the functional layer via the first insulation layer and first sacrificial layer (Figure 10). The movable elements are exposed by partially removing the at least one first sacrificial layer in the area of the movable elements using wet etching (p.4, paragraph 48). Although Reichenbach et al teach that vapor etching follows the wet etching step to remove the remainder of the first sacrificial layer, a component is described in Reichenbach et al after the wet etching and prior to the vapor etching, which is at the point between Figures 9 and 10 of the description. The at least one electrically non-conductive first insulation layer includes a material that is not substantially attacked by removing of the at least one first sacrificial layer (page 3, paragraphs 43 and 44). Regarding claim 5, the limitation "the at least one first sacrificial layer is removed at least in

areas of the immovable elements" is determined in light of the specification and drawings to be defining an intermediate step. Therefore, the limitation within the article claim presented is determined to define the component as having no sacrificial layer between the immovable elements and any layer that would have been below the sacrificial layer had one been present. In this case, Reichenbach et al teach that the immovable elements are in contact with the first insulation layer and not the first sacrificial layer.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 2 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reichenbach et al (WO 01/46066 A2). US 2004/0065932 A1 is used as the English equivalent for WO 01/46066 A2 for purposes of citing within this rejection.

Reichenbach et al teach all that is claimed in claim 1 as shown above. Note claim 20 includes all of the limitations of claim 1 in addition to the limitation that "the component includes at least one area where: the at least..." to the end of the claim. Reichenbach et al fail to explicitly teach in one embodiment that the electroconductive layer is arranged over the substrate layer and contactingly situated vertically between the at least one electrically non-conductive first insulation layer and the at least one first sacrificial layer. However in the embodiment of Figures 17-18, the electroconductive layer (reference number 14, Figure 18) is arranged over the substrate layer and contactingly situated vertically between the at least one electrically non-conductive first insulation layer (reference number 12, Figure 18) and the first sacrificial layer (the removed portion in Figure 18) (p.5, paragraph 57). The

embodiment described in page 5, paragraph 57 and shown in Figures 17 and 18, fails to explicitly teach that the movable elements are exposed by partially removing the at least one first sacrificial layer in the area of the movable elements. However, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made that the embodiment of Figures 17 and 18 described in page 5, paragraph 57 is formed by the same method steps described with regard to Figures 5-12. Therefore, at least at the point during the manufacture of the article of Figure 18 in which the wet etching has occurred but the vapor etching has not the first sacrificial layer would be partially removed in the area of the movable elements.

Thus, it would have been obvious to one having ordinary skill in the art that the embodiment of Figures 17 and 18 described in page 5, paragraph 57 teaches a component at least during the manufacture of the article in which the first sacrificial layer is partially removed in the area of the movable elements, as suggested by Reichenbach et al.

8. Claims 3-4 and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reichenbach et al (WO 01/46066 A2) in view of Laermer (WO 02/38492 A1). US 2004/0065932 A1 is used as

the English equivalent for WO 01/46066 A2 for purposes of citing within this rejection. US 2004/0112937 A1 is used as the English equivalent for WO 02/38492 A1 for purposes of citing within this rejection.

Reichenbach et al teach all that is claimed in claim 1 as shown above. Reichenbach et al further teach at least one second sacrificial layer (the part of reference number 30, Figure 7 that is above the movable elements). The component also comprises at least one second insulation layer (reference number 34, Figure 11). The movable elements are exposed by removing the at least one second sacrificial layer (Figure 11). The at least one second insulation layer includes a material that is not substantially attacked by the removing of the at least one second sacrificial layer because the sacrificial layer is made of silicon oxide and the second insulation layer is made of silicon nitride and because the second insulation layer is applied after removing the second sacrificial layer. The at least one electrically non-conductive first insulation layer and the at least one second insulation are in contact and therefore are located only in areas of the immovable elements (Figure 11). The limitation "the at least one second sacrificial layer is removed at least in areas of the immovable elements" is determined in light of the specification and drawings to be

defining an intermediate step. Therefore, the limitation within the article claim presented is determined to define the component as having no sacrificial layer between the immovable elements and any layer that would have been above the sacrificial layer, such as the second insulation layer, had one been present. In this case, Reichenbach et al teach that the immovable elements are in contact with the second insulation layer and not the second sacrificial layer. At least one of the immovable elements includes at least one electrode (Figure 34).

Reichenbach et al fail to teach forming a membrane layer over the surface micromechanical structure. However, Laermer teach that when covering micromechanical structures with insulating materials such as the silicon nitride of Reichenbach or the Pyrex glass of Laermer it is advantageous if the side of the glass or insulating material facing away from the microstructure have an electrically conductive layer or membrane, since then, the electrical voltage applied during bonding is distributed homogeneously over the entire surface of the glass element. Further, this layer permits electrostatic holding of the silicon wafer in a plasma etching system, during later backside structuring processes of the silicon layer, from which each respective microstructure is preferably patterned out (page 2, paragraph 12). One of ordinary skill in the art would

have recognized that an electrically conductive layer or membrane layer is coated over the side of the insulating layer applied as a hermetic seal for a micromechanical structure, in order to provide the component with a homogeneous distribution of electrical voltage and an electrostatic holding layer for backside structuring processes of the silicon substrate layer, as taught by Laermer.

Therefore, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made to arrange an electrically conductive membrane layer over the second insulation layer and second sacrificial layer of Reichenbach et al over the surface micromechanical structure of Reichenbach et al, in order to provide the component with a homogeneous distribution of electrical voltage and an electrostatic holding layer for backside structuring processes of the silicon substrate layer, as taught by Laermer.

Note that because the membrane layer of Laermer and Reichenbach et al combined is only connected to the second insulation layer and the second insulation layer is mechanically connected to the substrate via at least one of the immovable elements, then the membrane layer is at least indirectly mechanically connected to the substrate via at least one of the immovable elements.

9. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reichenbach et al (WO 01/46066 A2) in view of Laermer (WO 02/38492 A1) as applied to claim 3 above, and further in view of Zavracky et al (USPN 5,490,034).

Reichenbach et al and Laermer combined teach all that is claimed in claim 3 as shown above. Reichenbach et al further teach that the first and second sacrificial layers are formed of silicon oxide removed by HF etching medium (page 3, paragraph 44) and that the second insulation layer is formed of silicon nitride (page 4, paragraph 49).

Reichenbach et al and Laermer combined fail to teach the first insulation layer is formed of silicon nitride. Reichenbach et al teaches that the first insulation layer should be an insulating material that will not be removed by HF etching as quickly as silicon oxide, but fails to provide examples of a material that would accomplish these requirements. However, Zavracky et al, which also deals with forming micromechanical structures for microsensors, teaches that silicon nitride is a well known material that is not attacked by HF etching as quickly as silicon oxide during removal of the silicon oxide sacrificial layer (col.4, l.57-63 and Figures 2E and 2F). One of ordinary skill in the art would have recognized that silicon

nitride is a well known insulator used in forming micromechanical structures for sensors, that is not attached by HF etching as quickly as silicon oxide and would be used as an insulator that is not a sacrificial layer in a micromechanical structure, as taught by Zavracky et al.

Therefore, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made to use silicon nitride as the first insulator of Reichenbach et al because silicon nitride is a well known useful insulator in the art of micromechanical structures used to form sensors and is not attacked by HF etching as quickly as silicon oxide and therefore would not be removed during the removal of the sacrificial layer, as taught by Zavracky et al.

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reichenbach et al (WO 01/46066 A2) in view of Laermer (WO 02/38492 A1) as applied to claim 3 above, and further in view of Zavracky et al (USPN 5,490,034) and in view of Chatterjee et al.

Reichenbach et al and Laermer combined teach all that is claimed in claim 3 as shown above. Reichenbach et al further teach that the first and second sacrificial layers are formed of silicon oxide removed by HF etching medium (page 3, paragraph

44) and that the second insulation layer is formed of silicon nitride (page 4, paragraph 49).

Reichenbach et al and Laermer combined fail to teach the first insulation layer is formed of silicon nitride. Reichenbach et al teaches that the first insulation layer should be an insulating material that will not be removed by HF etching as quickly as silicon oxide, but fails to provide examples of a material that would accomplish these requirements. However, Zavracky et al, which also deals with forming micromechanical structures for microsensors, teaches that silicon nitride is a well known material that is not attacked by HF etching as quickly as silicon oxide during removal of the silicon oxide sacrificial layer (col.4, l.57-63 and Figures 2E and 2F). One of ordinary skill in the art would have recognized that silicon nitride is a well known insulator used in forming micromechanical structures for sensors, that is not attached by HF etching as quickly as silicon oxide and would be used as an insulator that is not a sacrificial layer in a micromechanical structure, as taught by Zavracky et al.

Therefore, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made to use silicon nitride as the first insulator of Reichenbach et al because silicon nitride is a well known useful

insulator in the art of micromechanical structures used to form sensors and is not attacked by HF etching as quickly as silicon oxide and therefore would not be removed during the removal of the sacrificial layer, as taught by Zavracky et al.

Reichenbach et al, Laermer, and Zavracky et al taken as a whole fail to teach that the silicon nitride forming the first and second insulation layers has silicon content greater than 42%. However, Chatterjee et al teach that a higher silicon content in silicon nitride, such as greater than 46%, helps to achieve a relatively low etch rate in comparison to silicon oxide when using an HF-based etching process (col.4, l.56-61). Based on the teachings of Reichenbach et al and Zavracky et al, one of ordinary skill in the art would have recognized that any manipulation of silicon nitride that result in achieving lower etch rates with regards to silicon oxide in an HF-based etching process would be advantageous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made to form the silicon nitride used as the first and second insulation layer of the component of Reichenbach et al, Laermer, and Zavracky et al with silicon content greater than 42%, in order to achieve a lower etch rate in comparison to silicon oxide when using an HF-based etching process, as taught by

Chatterjee, which is an useful advantage for the silicon nitride to possess as suggested by the teachings of Reichenbach et al and Zavracky et al.

Response to Arguments

11. Applicant's arguments regarding the 35 U.S.C. 112 rejection of claim 5 of record have been considered but they are not persuasive.

In response to Applicant's argument that the new limitation added to claim 5, clearly indicates that the at least one sacrificial layer is removed in "the areas of the immovable elements", the Examiner agrees. However, the claim is unclear because it is not understood how by removing an intermediate layer the layers on either side of the removed layer can be in direct contact with each other. As exemplified in Applicant's own specification and drawings, especially Figure 2, once part of the sacrificial layer is removed the immovable element and layer underneath are still not contacting each other. There may not be any other layers present between them, but there is at least a gap of air between where the sacrificial layer was prior to removal. Therefore, it is not understood how the element and layer are in direct contact with each other.

12. Applicant's arguments regarding the 35 U.S.C. 102 rejections of claims 1 and 5 as anticipated by Reichenbach have been considered but they are not persuasive.

In response to Applicant's argument that Reichenbach does not teach that the sacrificial layer is partially removed so that the sacrificial layer is both bonded to the substrate and the functional layer and also removed in such a way that the movable elements are exposed. Reichenbach does teach that the sacrificial layer is bonded to the substrate and the functional layer followed by removing it in such a way that the movable elements are exposed. It is agreed that Reichenbach does not explicitly teach what specific portions of the sacrificial layer remain after wet etching. However, Applicant's arguments are narrower then claim 1. There is no indication in Applicant's claims as to what specific portions of the sacrificial layer remain if any after partially removing the at least one first sacrificial layer in the area of the movable elements. Note the limitation that the sacrificial layer is "partially removed" does not limit the removal to leaving any substantial amount of sacrificial layer. Furthermore, the limitation that a substrate is connected to the functional layer via the at least one electrically non-conductive first insulation layer and the at least one first sacrificial layer is broader than argued.

Because of the wherein clauses and the process limitations of "partially removing" the claim can be interpreted in its broadest reasonable interpretation to include articles in which the first sacrificial layer is bonded between the functional layer and substrate prior to partially removing. The claim can also be interpreted to include articles in which after removal the combination of the at least one electrically non-conductive first insulation layer and the at least one first sacrificial layer connects the functional layer and substrate. The scope of claim 1 is much broader then Applicant's interpretation that after partially removing the sacrificial layer there are portions of the remaining sacrificial layer that connect the functional layer to the substrate.

13. Applicant's arguments regarding the 35 U.S.C. 103 rejections of claims 2-9 and 20 of record have been considered but they are not persuasive.

Applicant has relied on the same arguments regarding claim 1 for the patentability of claims 2-9 and 20. Therefore, look to the answer to those arguments above.

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher P. Bruenjes whose telephone number is 571-272-1489. The examiner can normally be reached on Monday thru Friday from 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christopher P Bruenjes
Examiner
Art Unit 1772

CPB CPB
February 10, 2007

ALICIA CHEVALIER
PRIMARY EXAMINER